UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/821,027	03/30/2001	Jian J. Chen	2328-050	5541

7590 11/04/2004

Allan M. Lowe
LOWE HAUPTMAN GILMAN & BERNER, LLP
1700 Diagonal Road, Suite 310
Alexandria, VA 22314

EXAMINER	
CROWELL, ANNA M	
ART UNIT	**PAPER NUMBER**
1763	

DATE MAILED: 11/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450
www.uspto.gov

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/821,027
Filing Date: March 30, 2001
Appellant(s): CHEN ET AL.

Mr. Allan M. Lowe
For Appellant

EXAMINER'S ANSWER

Lowe, Hauptman, Gilman & Berner, L.L.P.
1700 Diagonal Road, Suite 300
Alexandria, VA 22314

This is in response to the appeal brief filed August 20, 2004.

(1) ***Real Party in Interest***

A statement identifying the real party in interest is contained in the brief.

(2) ***Related Appeals and Interferences***

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) ***Status of Claims***

The statement of the status of the claims contained in the brief is correct.

Claims 1-25 and 28-40 are pending in the application. Claims 1-10 are withdrawn from consideration. Claims 11-25 and 28-40 stand finally rejected.

(4) ***Status of Amendments After Final***

The appellant's statement of the status of amendments after final rejection contained in the brief is correct. An amendment after final was submitted on February 23, 2004 and has been entered. Claim 34 was amended to correct the misspelled word "nged" to –arranged--. No new issues are raised by this change, which was caused by this amendment. Examiner maintained the final rejection in the Advisory action mailed on March 31, 2004, and indicated that the request for reconsideration was considered, but does not place the application in condition for allowance due to the outstanding rejections.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

The present invention is directed to an inductive plasma apparatus for processing a workpiece. The apparatus comprises a plasma excitation coil, a power source, variable impedance arrangements, and a controller. The plasma excitation coil includes plural parallel connected windings and the power source is connected to the plural parallel connected windings. Additionally, variable impedance arrangements are connected to each of the plural parallel connected windings. The controller is connected to the source and the variable impedance arrangements in order to directly vary the total output power of the source and the total power the source supplies to the plural connected windings and vary the values of the variable impedance arrangements. By varying the total output power of the source and the values of the variable impedance arrangements, different amounts of total power and different relative currents are supplied to the plural parallel connected windings to yield different distributions of electromagnetic fields.

(6) Issues

The appellant's statement of the issues in the brief is substantially correct.

1. Claims 11 and 31 are anticipated under 35 U.S.C. 102(a) by Chu et al. (US 6,051,073).

2. Claims 12, 32-35, 37, and 39 are unpatentable under 35 U.S.C. 103(a) over Chu et al. (US 6,051,073).

3. Claims 11, 12, 31-35, 37, and 39 are unpatentable under 35 U.S.C. 103(a) over Sato et al. (US 5,907,221) in view of Tomioka et al. (US 5,897,713).

4. Claims 13-16, 18-25, 28-30, 36, 38, and 40 are unpatentable under 35 U.S.C. 103(a) over Chu et al. (US 6,051,073) in view of Chen et al. (WO 00/00993).

5. Claims 13-16, 18-25, 28-30, 36, 38, and 40 are unpatentable under 35 U.S.C. 103(a) over Sato et al. (US 5,907,221) in view of Tomioka et al. (US 5,897,713) and Chen et al. (WO 00/00993).

6. Claims 17-18 are unpatentable under 35 U.S.C. 103(a) over Chu et al. (US 6,051,073) in view of Van Gogh et al. (US 6,579,426).

7. Claims 17-18 are unpatentable under 35 U.S.C. 103(a) over Sato et al. (US 5,907,221) in view of Tomioka et al. (US 5,897,713) and Van Gogh et al. (US 6,579,426).

8. An ancillary issues with regard to issues 2-7 is that a prima facie case of obviousness is not established because an apparatus is capable of being controlled to achieve a particular result. The Examiner's position in this regard is contrary to decisions of the Federal Circuit, for example, In re Mills, 916 F2d 680, 16 USPQ 2nd 1430 (Fed. Cir. 1990).

*(7) **Grouping of Claims***

The rejection of claims 11-25 and 28-40 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

6,051,073	CHU ET AL.	04-2000
5,907,221	SATO ET AL.	05-1999
5,897,713	TOMIOKA ET AL.	04-1999
00/00993	CHEN ET AL.	01-2000
6,579,426	VAN GOGH ET AL.	06-2003
6,238,512	LI ET AL.	05-2001

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 11 and 31 are rejected under 35 U.S.C. 102(a) as being anticipated by Chu et al. (U.S. 6,051,073).

Referring to Figure 2 and column 5, line 48-column 6, line 16, Chu et al. discloses

an inductive plasma processor 200 for processing a workpiece 203, comprising a plasma excitation coil , the coil including plural parallel connected windings 40, an AC, RF source 66 for supplying power to the plural parallel connected windings (col. 5, lines 50-51), the source being connected to the plural parallel connected windings for causing current from the source to flow in parallel to the plural parallel connected windings, variable impedance arrangements 50 and 58 respectively coupled with the plural parallel connected windings for varying the currents flowing from the source to each of the plural parallel connected windings, and a controller 62 coupled to the source and components for directly varying the total output power of the source and the total power the source supplies to the plural parallel connected windings and varying values of components of the variable impedance arrangements so that for different distributions of electromagnetic fields, different amounts of total power are applied to the plural parallel connected windings (col. 5, lines 57-60), and different amounts of current applied to the individual plural windings of the plural parallel connected windings (col. 5, lines 50-55).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any

evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 12, 32-35, 37, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (U.S. 6,052,073).

Regarding claim 12 and 34, the apparatus of Chu et al. is capable of controlling the total power and the variable impedance arrangements in the different windings. Therefore, it would have been an obvious choice of design to one of ordinary skill in the art to arrange the controller so that the current flowing in one of the windings will be substantially constant while the current in the remaining winding changes in order to control the distribution and the uniformity of the plasma, therefore controlling the process being performed within the apparatus.

Regarding claims 32-33, the apparatus of Chu et al. includes plural parallel windings arranged so one of the windings is an exterior winding 40 located so electromagnetic fields generated by it are in proximity to a peripheral wall 14 of the chamber, and electromagnetic fields generated by the remainder of the coil 40 are remote from the chamber peripheral wall. The controller of Chu et al. is capable of varying the total power and the current in the each winding. Therefore, it would have been an obvious choice of design to one of ordinary skill in the art to arrange the controller so that the current applied to the exterior winding is varied in order that the electromagnetic field generated by the exterior winding exceeds, is less than, or is the same as the electromagnetic field generated by the remainder of the coil in order to control

the distribution and the uniformity of the plasma, therefore controlling the process being performed within the apparatus.

Regarding claims 35, 37, and 39, the apparatus of Chu et al. includes plural windings 46 extending radially and circumferentially between a pair of excitation terminals connected for receiving power from output terminals of the source 66 (Fig. 1).

6. Claims 11, 12, 31-35, 37, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. (U.S. 5,907,221) in view of Tomioka et al. (U.S. 5,897,713) or Chu et al. (U.S. 6,052,073).

Referring to Figure 6 and column 4, lines 4-26, Sato et al. discloses an inductive plasma processor for processing a workpiece 35, comprising a plasma excitation coil, the coil including plural parallel connected windings 150a-k, an AC, RF source 170 for supplying power to the plural parallel connected windings, the source being connected to the plural parallel connected windings for causing current from the source to flow in parallel to the plural parallel connected windings, variable impedance arrangements 160a-k and 165a-k respectively coupled with the plural parallel connected windings for varying the currents flowing from the source to each of the plural parallel connected windings (col.4, lines 16-21), and a controller 180 couple to components for varying the amount of current applied to the individual plural windings of the plural parallel connected windings so that for different distributions of electromagnetic fields different amounts of current are applied to the individual winding.

Sato et al. fails to teach a controller for directly varying the total output of power applied to the plural parallel connected windings.

Referring to column 8, lines 34-37, Tomioka et al. teaches an inductive plasma processor comprising a controller 14 for directly varying the total output power the source supplies to the plural parallel connected windings. By using a controller, the frequency, phase, and power of the source 7 are controlled. Similarly, referring to column 4, lines 18-20, Chu et al. teaches an inductive plasma processor comprising a controller 62 for varying the total power the source supplies to the plural parallel connected windings. By using a controller, the frequency, phase, and power of the source 66 are controlled. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a controller for varying the total amount of power applied to the plural parallel connected windings as taught by Tomioka et al. or Chu et al. in the apparatus of Sato et al. because this allow the frequency, phase, and power of the source to be controlled.

Regarding claim 12 and 34, the apparatus of Sato et al. in view of Tomioka et al or Chu et al. is capable of controlling the total power and the variable impedance arrangements in the different windings. Therefore, it would have been an obvious choice of design to one of ordinary skill in the art to arrange the controller so that the current flowing in one of the windings will be substantially constant while the current in the remaining winding changes in order to control the distribution and the uniformity of the plasma, therefore controlling the process being performed within the apparatus.

Regarding claims 32-33, the apparatus of Sato et al. in view of Tomioka et al or Chu et al. includes plural parallel windings arranged so one of the windings is an exterior winding 40 located so electromagnetic fields generated by it are in proximity to a peripheral wall 14 of the chamber, and electromagnetic fields generated by the remainder of the coil 40 are

remote from the chamber peripheral wall. The controller of Chu et al. is capable of varying the total power and the current in the each winding. Therefore, it would have been an obvious choice of design to one of ordinary skill in the art to arrange the controller so that the current applied to the exterior winding is varied in order that the electromagnetic field generated by the exterior winding exceeds, is less than, or is the same as the electromagnetic field generated by the remainder of the coil in order to control the distribution and the uniformity of the plasma, therefore controlling the process being performed within the apparatus.

Regarding claims 35, 37, and 39, the apparatus of Sato in view of Tomioka et al or Chu et al. includes plural windings 150a, 150b (Sato et al.) extending radially and circumferentially between a pair of excitation terminals connected for receiving power from output terminals 165a, 165b of the source 170 (Fig. 6).

7. Claims 13-16, 19-25, 28-30, 36, 38, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (U.S. 6,052,073) in view of Chen et al. (WO 00/00993).

The teachings of Chu et al. have been discussed above.

Chu et al. fails to specifically teach varying the location and the value of the maximum amplitude of a standing wave in the windings.

Referring to Figures 3, 4, 6, and page 6, line 19 – page 7, line 22, page 8, line 4 – page 13, line 12, and page 14, line 19 – page 16, line 6, Chen teaches an inductive plasma processor wherein each of the impedance arrangements includes a variable reactance C1-C4 coupled to its respective winding coil 1 and coil 2, the variable reactance of each impedance arrangement being arranged for varying the location (page 15, line 25-page 16, line 6) and the

value of the maximum amplitude (page. 6, lines 19-24) of a current in its respective winding. By varying the location and the value of the maximum amplitude of the current in the respective windings, the plasma density in different radial and azimuthal regions can be varied and controlled, and therefore, radially and azimuthally uniform plasma can be achieved (abstract). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to vary the location and the value of the maximum amplitude of a standing wave in the respective windings as taught by Chen et al. in the apparatus of Chu et al. since the controller of Chu et al. is capable of varying the variable reactance of each impedance arrangement, and furthermore uniform plasma is achieved.

Chu et al. fails to teach each of the windings including first and second end terminals which are connected to first and second capacitors.

Chen et al. teaches an inductive plasma processor wherein each of the windings coil 1 and coil 2 including first and second end terminals and each of the impedance arrangements includes first and second capacitors C1-C4, each of the first capacitors C1 and C2 being connected in series with its respective first terminal for supplying RF energy from the RF source to the respective winding, each of the second capacitors in series with its respective second terminal and ground (Figures 4 and 6, page 8, lines 4-24, page 15, lines 4-8). By providing two capacitors for each coil, a more symmetric current distribution is achieved along the coil. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for each winding to have first and second capacitors connected to first and second end terminals as taught by Chen et al. in the apparatus of Chu et al. since a more symmetric current distribution is achieved along the coil.

Chu et al. fails to teach one of the windings is an interior winding and another of the windings is an exterior winding surrounding the interior winding.

Chen et al. teaches a vacuum plasma processor wherein one of the windings is an interior winding and another of the windings is an exterior winding surrounding the interior winding since uniform plasma density is achieved in the chamber (col. 4. lines 1-8). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to rearrange the windings of Chu et al. to have one of the windings as interior winding and another of the windings as an exterior winding surrounding the interior winding since uniform plasma density is achieved in the chamber.

8. Claims 13-16, 19-25, 28-30, 36, 38, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. (U.S. 5,907,221) in view of Tomioka et al. (U.S. 5,897,713) or Chu et al. (U.S. 6,052,073) as applied to claims 11, 12, and 31-35, 37, and 39 above, and further in view of Chen et al. (WO 00/00993).

The teachings of Sato et al. in view of Tomioka et al. or Chu et al. have been discussed above.

Sato et al. in view of Tomioka et al. or Chu et al. fails to specifically teach varying the location and the value of the maximum amplitude of a standing wave current in windings.

Referring to Figures 3, 4, 6, and page 6, line 19 – page 7, line 22, page 8, line 4 – page 13, line 12, and page 14, line 19 – page 16, line 6, Chen teaches an inductive plasma processor wherein each of the impedance arrangements includes a variable reactance C1-C4 coupled to its respective winding coil 1 and coil 2, the variable reactance of each impedance

arrangement being arranged for varying the location (page 15, line 25-page 16, line 6) and the value of the maximum amplitude (page. 6, lines 19-24) of a current in its respective winding. By varying the location and the value of the maximum amplitude of the current in the respective windings, the plasma density in different radial and azimuthal regions can be varied and controlled, and therefore, radially and azimuthally uniform plasma can be achieved (abstract). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to vary the location and the value of the maximum amplitude of a standing wave in the respective windings as taught by Chen et al. in the apparatus of Sato et al. in view of Tomioka et al. or Chu et al since the controller of Sato et al. in view of Tomioka et al. or Chu et al. is capable of varying the variable reactance of each impedance arrangement, and furthermore uniform plasma is achieved.

Sato et al. in view of Tomioka et al. or Chu et al. fail to teach each of the windings including first and second end terminals which are connected to first and second capacitors.

Chen et al. teaches an inductive plasma processor wherein each of the windings coil 1 and coil 2 including first and second end terminals and each of the impedance arrangements includes first and second capacitors C1-C4, each of the first capacitors C1 and C2 being connected in series with its respective first terminal for supplying RF energy from the RF source to the respective winding, each of the second capacitors in series with its respective second terminal and ground (Figures 4 and 6, page 8, lines 4-24, page 15, lines 4-8). By providing two capacitors for each coil, a more symmetric current distribution is achieved along the coil. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for each winding to have first and second capacitors connected to first and second end terminals as taught

by Chen et al. in the apparatus of Sato et al. in view of Tomioka et al. or Chu et al. since a more symmetric current distribution is achieved along the coil.

Sato et al. in view of Tomioka et al. or Chu et al. fails to teach one of the windings is an interior winding and another of the windings is an exterior winding surrounding the interior winding.

Chen et al. teaches a vacuum plasma processor wherein one of the windings is an interior winding and another of the windings is an exterior winding surrounding the interior winding since uniform plasma density is achieved in the chamber (col. 4. lines 1-8). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to rearrange the windings of Sato et al. in view of Tomioka et al. or Chu et al. to have one of the windings as interior winding and another of the windings as an exterior winding surrounding the interior winding since uniform plasma density is achieved in the chamber.

9. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (U.S. 6,052,073) in view of van Gogh et al. (U.S. 6,579,426).

The teachings of Chu et al. have been discussed above.

Chu et al. fails to teach each of the windings including first and second end terminals which are connected to first and second capacitors.

Van Gogh et al. teaches an inductive plasma processor wherein a winding 104 including a first and second end terminals b and d and each of the impedance arrangements includes first and second capacitors 310 and 308, each of the first capacitors 310 and 308 being connected in series with its respective first terminal for supplying RF energy from the RF source to the

respective winding, each of the second capacitors in series with its respective second terminal and ground (Figures 2 and 3, col.4, lines 54-64, col. 5, line 45 - col. 6, line 6). By providing two capacitors for each coil, a more symmetric current distribution is achieved along the coil. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for each winding to have first and second capacitors connected to first and second end terminals as taught by van Gogh et al. in the apparatus of Chu et al. since a more symmetric current distribution is achieved along the coil.

10. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. in view of Tomioka et al. (U.S. 5,897,713) or Chu et al. (U.S. 6,052,073) as applied to claims 11, 12, and 31-35, 37, and 39 above, and further in view of van Gogh et al. (U.S. 6,579,426).

The teachings of Sato et al. in view of Tomioka et al. or Chu et al. have been discussed above.

Sato et al. in view of Tomioka et al. or Chu et al. fails to teach each of the windings including first and second end terminals which are connected to first and second capacitors.

Van Gogh et al. teaches an inductive plasma processor wherein a winding 104 including a first and second end terminals b and d and each of the impedance arrangements includes first and second capacitors 310 and 308, each of the first capacitors 310 and 308 being connected in series with its respective first terminal for supplying RF energy from the RF source to the respective winding, each of the second capacitors in series with its respective second terminal and ground (Figures 2 and 3, col.4, lines 54-64, col. 5, line 45 - col. 6, line 6). By providing two capacitors for each coil, a more symmetric current distribution is achieved along the coil. Thus,

it would have been obvious to one of ordinary skill in the art at the time of the invention for each winding to have first and second capacitors connected to first and second end terminals as taught by van Gogh et al. in the apparatus of Sato et al. in view of Tomioka et al. or Chu et al. since a more symmetric current distribution is achieved along the coil.

Response to Arguments

I. **Appellant has argued that no rationale or evidence to indicate Chu et al. has different electromagnetic field distributions as a result of a controller varying output power of a source and varying an impedance arrangement, as claim 11 requires and that the Examiner apparently relies on inherency for this feature.** However, Chu et al. states the output power 66 is controlled directly from the controller 62 (column 5, lines 58-59) and the variable impedance arrangements 58 are varied by the controller 62 (column 5, lines 50-55). Additionally, it should be noted that claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. (In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997)) and apparatus claims cover what a device is, not what a device does (Hewlett-Packard Co. v. Bausch & Lomb Inc., 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original)). Thus, since the apparatus of Chu et al. discloses a controller for controller varying output power of a source and varying the variable impedance arrangements, the structural limitations of apparatus claim 11 have been satisfied and therefore the function of providing different electromagnetic field distributions is considered intended use and is not given patentable weight in apparatus claims. Furthermore, it

should be noted that since the apparatus of Chu et al. discloses a controller for controller varying output power of a source and varying the variable impedance arrangements, a result of different electromagnetic field distributions can be achieved.

II. Appellant has argued that the statement in the Advisory Action regarding Li et al. is not considered because Li et al. does not appear to be of record. This is incorrect. The Li et al. reference (US 6,238,512) was listed on the 892 dated March 31, 2004.

III. Appellant has argued that Chu et al. does not disclose applying different amounts of current to individual windings and different amounts of total power to the windings for different distributions of electromagnetic fields as claim 31 requires and that the Examiner apparently relies on inherency for this feature. However, Chu et al. states the AC source 66 is controlled directly from the controller 62 (column 5, lines 58-59) and the variable impedance arrangements 58 is varied by the controller 62 which is capable of applying different amounts of current to the individual windings(column 5, lines 50-55). Additionally, it should be noted that claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. (In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997)) and apparatus claims cover what a device is, not what a device does (Hewlett-Packard Co. v. Bausch & Lomb Inc., 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original)). Thus, since the apparatus of Chu et al. discloses a controller for controller varying AC source and varying the variable impedance arrangements, the structural limitations of apparatus claim 31 have been satisfied and therefore the function of providing

different electromagnetic field distributions is considered intended use and is not given patentable weight in apparatus claims. Furthermore, it should be noted that since the apparatus of Chu et al. discloses a controller for controller varying AC source and varying the variable impedance arrangements, a result of different electromagnetic field distributions can be achieved.

IV. **Appellant has argued that Examiner has given no reason for the conclusion, with respect to claims 12 and 34, that it would have been an obvious choice of design to one of ordinary skill in the art to arrange the Chu controller so that the current flowing in one of the windings is substantially constant while the current in the remaining winding changes to control the distribution and uniformity of the plasma and therefore an improper test for establishing obviousness was applied.** However, Chu et al. states the RF source 66 is controlled directly from the controller 62 (column 5, lines 58-59) and the variable impedance arrangements 58 is varied by the controller 62 which is capable of applying different amounts of current to the individual windings(column 5, lines 50-55). Additionally, it should be noted that claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. (In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997)) and apparatus claims cover what a device is, not what a device does (Hewlett-Packard Co. v. Bausch & Lomb Inc., 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original)). Thus, since the apparatus of Chu et al. discloses a controller for controller varying RF source and varying the variable impedance arrangements, the structural limitations of apparatus claims 12 and 34 have been satisfied and therefore the function of the

current flowing in one of the windings is substantially constant while the current in the remaining winding changes is considered intended use and is not given patentable weight in apparatus claims. Furthermore, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or **in the knowledge generally available to one of ordinary skill in the art.** See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). Consequently, the Examiner's motivation to arrange the controller of Chu et al. for having the current flowing in one of the windings is substantially constant while the current in the remaining winding changes is to control the distribution and uniformity of the plasma, thereby controlling the process being performed within the apparatus. Additionally, Chu et al. discloses that by controlling the variable impedance arrangements, uniformity of plasma is achieved (col. 5, lines 53-55). Furthermore, Li et al. teaches that by controlling the power, plasma distribution is achieved (col. 12, lines 19-37).

V. **Appellant has argued that the position of the Examiner that "The prior art only has to provide a structure that is capable of performing in the manner claimed and no necessarily have ever been intended to be used in this manner." is contrary to established law of *In re Mills*, 916 F.2d 6.80, 16 USPQ 2nd 1430 (Federal Circuit 1990).** However, as stated above, the claimed invention is directed to an apparatus, thus the claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. (In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997)) and

apparatus claims cover what a device is, not what a device does (Hewlett-Packard Co. v. Bausch & Lomb Inc., 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original)). Moreover, the *In re Mills* law further states that motivation for modifying a prior art device must be given. Therefore, the motivation to arrange the controller of Chu et al. for having the current flowing in one of the windings is substantially constant while the current in the remaining winding changes is to control the distribution and uniformity of the plasma, thereby controlling the process being performed within the apparatus. Chu et al. discloses that by controlling the variable impedance arrangements, uniformity of plasma is achieved (col. 5, lines 53-55).

VI. **Appellant has argued that the Examiner has apparently relied on Applicant's disclosure to arrive at the conclusion that a controller which causes the current flowing in one winding to be constant while causing the current in the remainder of the coil to vary provides control for the distribution an uniformity of the plasma.** The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). Thus, Chu et al. discloses that by controlling the variable impedance arrangements, uniformity of plasma is achieved (col. 5, lines 53-55). Furthermore, Li et al. teaches that by controlling the power, plasma distribution is

achieved (col. 12, lines 19-37). Therefore, the conclusion was based on the prior art and not Applicant's disclosure.

VII. Appellant has argued that Examiner has given no rationale for the conclusion, with respect to claims 32 and 33, that it would have been an obvious choice of design to one of ordinary skill in the art to arrange the Chu controller so that the current applied to the exterior winding is varied in order that the electromagnetic field generated by the exterior winding exceeds, is less than, or is the same as the electromagnetic field generated by the remainder of the coil in order to control the distribution and uniformity of the plasma and therefore an improper test for establishing obviousness was applied. However, Chu et al. states the RF source 66 is controlled directly from the controller 62 (column 5, lines 58-59) and the variable impedance arrangements 58 is varied by the controller 62 which is capable of applying different amounts of current to the individual windings (column 5, lines 50-55). Additionally, it should be noted that claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. (In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997)) and apparatus claims cover what a device is, not what a device does (Hewlett-Packard Co. v. Bausch & Lomb Inc., 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original)). Thus, since the apparatus of Chu et al. discloses a controller for controller varying RF source and varying the variable impedance arrangements, the structural limitations of apparatus claims 32 and 33 have been satisfied and therefore the function of the electromagnetic field generated by the exterior winding exceeds, is less than, or is the same as the electromagnetic field generated by the remainder of the coil is

considered intended use and is not given patentable weight in apparatus claims. Furthermore, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or **in the knowledge generally available to one of ordinary skill in the art.** See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). Consequently, the Examiner's motivation to arrange the controller of Chu et al. for having the electromagnetic field generated by the exterior winding exceeds, is less than, or is the same as the electromagnetic field generated by the remainder of the coil is to control the distribution and uniformity of the plasma, thereby controlling the process being performed within the apparatus. Additionally, Chu et al. discloses that by controlling the variable impedance arrangements, uniformity of plasma is achieved (col. 5, lines 53-55). Furthermore, Li et al. teaches that by controlling the power, plasma distribution is achieved (col. 12, lines 19-37).

VIII. Appellant has argued that one of the requirements of claims 32 and 33 is for the electromagnetic fields generated by the remainder of the coil (i.e., the portion of the coil that is not the exterior winding) to be remote from the chamber wall which is not found in Chu et al. and thus a prima facie case of obviousness has not been established. This is incorrect. Claims 32 and 33 require that the remainder of the coil be remote from the chamber **peripheral** wall. As seen in Figure 2 of Chu et al., the center winding 46 is remote from the chamber **peripheral** wall.

IX. Appellant has argued that since Tomioka et al. fails to disclose plural parallel connected windings, the rejection of Sato et al. in view of Tomioka et al. is void. This is incorrect. This rejection is valid simply because one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In the instant case, the primary reference Sato et al. clearly discloses plural parallel connected windings. Tomioka et al. was merely applied for the teachings of a controller for directly varying the total output power. Therefore, Sato et al. in view of Tomioka et al. satisfy the requirements of claims 11, 12, 31-35, 37, and 39. Additionally, in column 5, lines 40-55, Tomioka et al. teach that the power is supplied to a parallel resonance circuit. Furthermore, it should be noted about the invention that it is a coil including a plurality of windings 40, 42. The windings include an inner winding 40 and an outer winding 42. The two windings are not physically in parallel, they are concentric. The current supplied to each winding is in parallel. Moreover, there is no physical connection between the two windings, but simply current is supplied to each winding from one source.

X. Appellant has argued that there is no satisfactory reason why one of ordinary skill would have modified the output power of source 180 in Sato et al. with Tomioka et al. This is incorrect. The motivation to modify the output power source of Sato et al. with Tomioka et al. is to allow the frequency, phase, and output power of the source to be controlled and thus enhance overall process control.

XI. Appellant has argued that none of the references has a disclosure of varying power to achieve the claimed different distributions of electromagnetic fields. As stated similarly in paragraph I, Tomioka et al. states the output power 7 is controlled directly from the controller 14 (Figure 4, column 6, lines 11-14) and the variable impedance arrangements 160a-160k is varied by the controller 180 (Figure 6, column 4, lines 16-18) of Sato et al. Additionally, it should be noted that claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. (In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997)) and apparatus claims cover what a device is, not what a device does (Hewlett-Packard Co. v. Bausch & Lomb Inc., 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original)). Thus, since the apparatus of Sato et al. in view of Tomioka et al. discloses a controller for controller varying output power of a source and varying the variable impedance arrangements, the structural limitations of apparatus claim 11, 12, 31-35, 37, and 39 have been satisfied and therefore the function of providing different electromagnetic field distributions is considered intended use and is not given patentable weight in apparatus claims. Thus, combination of Sato et al. in view of Tomioka et al. satisfies the requirements of apparatus claims 11, 12, 31-35, 37, and 39.

XII. Appellant has argued, with respect to claims 12 and 32-34, that the test for obviousness is not what something is capable of doing, but what is obvious to one of ordinary skill in the art. The Examiner has made no attempt to establish a rationale as to why the foregoing limitations are obvious. There is no motivation to vary the output power of source 180 as the Examiner improperly suggests; there is no suggestion in the references

to modify the Sato et al output power. As stated similarly in paragraphs IV and VII, the apparatus of Sato et al. in view of Tomioka et al. discloses a controller for controller varying RF source and varying the variable impedance arrangements, the structural limitations of apparatus claims 12, 32-34 have been satisfied and therefore the **function** of the current flowing in one of the windings is substantially constant while the current in the remaining winding changes *or* of the electromagnetic field generated by the exterior winding exceeds, is less than, or is the same as the electromagnetic field generated by the remainder of the coil is considered **intended use** and is not given patentable weight in apparatus claims. Furthermore, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or **in the knowledge generally available to one of ordinary skill in the art.** See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). The motivation to modify the output power source of Sato et al. with Tomioka et al. is to allow the frequency, phase, and output power of the source to be controlled and thus enhance overall process control. Consequently, the Examiner's motivation to arrange the controller of Sato et al. in view of Tomioka et al. for having the current flowing in one of the windings is substantially constant while the current in the remaining winding changes *or* the electromagnetic field generated by the exterior winding exceeds, is less than, or is the same as the electromagnetic field generated by the remainder of the coil is to control the distribution and uniformity of the plasma, thereby controlling the process being performed within the apparatus. **It must be emphasized that the motivation does not have to be found in the applied reference, but it can be gleaned from**

knowledge generally available to one of ordinary skill in the art. Additionally, Chu et al. discloses that by controlling the variable impedance arrangements, uniformity of plasma is achieved (col. 5, lines 53-55). Furthermore, Li et al. teaches that by controlling the power, plasma distribution is achieved (col. 12, lines 19-37).

XIII. Appellant has argued that one of ordinary skill in the art would not have modified Chu et al. as a result of Chen et al. because the Chu et al. and Chen et al. coils differ so extensively and there is no rationale for the combination. However, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). Chen et al. teaches that by varying the location and value of the maximum amplitude of the standing wave current, uniform plasma can be achieved. It should be noted that the teachings (i.e. standing wave current) of Chen et al. was applied to Chu et al., not the coil configuration. Thus, combining Chu et al. with Chen et al. will further improve plasma uniformity.

XIV. Appellant has argued that since claim 18 depends on claim 17 which has not been rejected on the combination of Chu et al and Chen et al. but instead claim 17 is rejected on the combination of Chu et al and Van Gogh(US 6,579,426.), it appears to be lack of an antecedent basis for the rejection of claim 18 as a result of Chu et al and Chen et al. It

should be noted that claim 18 was previously finally rejected in the Chu et al. in view of Van Gogh rejection. Also, claim 18 was inadvertently included in the Chu et al. in view of Chen et al. rejection, and thus claim 18 has been dropped from the Chu et al. in view of Chen et al. rejection.

XV. **Appellant has argued that Chu et al. fails to include an arrangement wherein one winding is an interior winding and another winding is an exterior winding surrounding the interior winding as in claims 36, 38, and 40.** However, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In the instant rejection, the combination of Chu et al. in view of **Chen et al.** was applied to reject claims 36, 38, and 40. The motivation to modify the coils of Chu et al. to have one winding as an interior winding and another winding as an exterior winding surrounding the interior winding as taught by **Chen et al.** is to improve uniform plasma density in the chamber.

XVI. **Appellant has argued that neither the final office action nor the advisory action discusses the features of claims 16, 19, 24-25, or 28-30 having the frequency of the source and the length of the windings such that there are no substantial standing wave current variations along the length of each winding, thus a prima facie case of obviousness has not been established with respect to rejection Chu et al. in view of Chen et al.** However, Chu et al. states the output power 66 (i.e. frequency) is controlled directly from the controller 62

(column 5, lines 58-59) and the variable impedance arrangements 58 is varied by the controller 62 (column 5, lines 50-55). Chen et al. discusses varying the value and location of the standing wave current. Furthermore, if the frequency of the source was selected to be zero or if no power was applied to the coil, no substantial standing wave current variations would occur along the length. Additionally, it is well known in the art alter the length of a winding to achieve a desired process. Furthermore, it noted that the rejection is over apparatus claims and not method claims. The prior art only has to provide a structure that is capable of performing in the manner claimed and not necessarily have ever been intended to be used in this manner. Thus, the apparatus of Chu et al. in view of Chen et al. is capable of controlling the frequency and the length of the windings, and thus having no substantial standing wave current variations along the length of each winding is considered intended use.

XVII. Appellant has argued that the Examiner ignores the fact that claim 20 requires adjacent windings have standing wave current maxima that are radially opposite to each other. This is incorrect. The apparatus of Chu et al. in view of Chen et al. discloses a controller 62 for varying the power 66 and the values of the reactances of the impedance arrangements 50, 58 (Chu et al.) and teaches varying the location and the value of the maximum amplitude of the standing wave current in the windings (Chen et al.). Therefore, since the apparatus of Chu et al. in view of Chen et al. discloses a controller for controller varying output power of a source and varying the variable impedance arrangements and controlling the value and location of the standing wave current in each winding, the structural limitations of apparatus claim 20 have been satisfied and therefore the function of providing adjacent windings having standing wave current

maxima that are radially opposite to each other is considered intended use and is not given patentable weight in apparatus claims. Thus, combination of Chu et al. in view of Chen et al. satisfies the requirements of apparatus claim 20.

XVIII. Appellant has argued that one of ordinary skill in the art would not have modified Sato et al. as a result of Tomioka et al. and Chen et al. because the Sato et al. and Chen et al. coils differ so extensively and there is no rationale for the combination. However, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). Chen et al. teaches that by varying the location and value of the maximum amplitude of the standing wave current, uniform plasma can be achieved. It should be noted that the teachings (i.e. varying the location and value of the maximum amplitude of the standing wave current) of Chen et al. was applied to Sato et al. in view of Tomioka et al., not the coil configuration. Thus, combining Sato et al. with Tomioka et al. and Chen et al. will further improve plasma uniformity.

XIX. Appellant has argued that neither the final office action nor the advisory action discusses the features of claims 16, 19, 24-25, or 28-30 having the frequency of the source and the length of the windings such that there are no substantial standing wave current variations along the length of each winding, thus a prima facie case of obviousness has not

been established with respect to rejection Sato et al. in view of Tomioka et al. and Chen et al. However, Tomioka et al. states the output power 7 or 10 (i.e. frequency) is controlled directly from the controller 14 (column 6, lines 11-14) and the variable impedance arrangements 160a-k are varied by the controller 180 (column 4, lines 15-21). Chen et al. discusses varying the value and location of the standing wave current. Furthermore, if the frequency of the source was selected to be zero or if no power was applied to the coil, no substantial standing wave current variations would occur along the length. Additionally, it is well known in the art alter the length of a winding to achieve a desired process. Furthermore, it noted that the rejection is over apparatus claims and not method claims. The prior art only has to provide a structure that is capable of performing in the manner claimed and not necessarily have ever been intended to be used in this manner. Thus, the apparatus of Sato et al. in view of Tomioka et al. and Chen et al. is capable of controlling the frequency and the length of the windings, and thus having no substantial standing wave current variations along the length of each winding is considered intended use.

XX. **Appellant has argued that altering the length of a winding to achieve a desired process does not mean it is obvious to make the length of a winding and the frequency of a source such that there are no substantial standing wave current variations along the length of the winding.** As stated above, since the apparatus of Sato et al. in view of Tomioka et al. and Chen et al. discloses a controller for controller varying output power of a source, varying the variable impedance arrangements, controlling the value and location of the standing wave current in each winding, controlling the frequency in each winding, and altering the length of

each winding, the structural limitations of apparatus claims 16, 19, 24, 25, 29, and 30 have been satisfied and therefore the function of no substantial standing wave current variations along the length of the winding is considered intended use and is not given patentable weight in apparatus claims. Thus, combination of Sato et al. in view of Tomioka et al. and Chen et al. satisfies the requirements of apparatus claim 16, 19, 24, 25, 29, and 30.

XXI. Appellant has argued that because of the differences in the Chu et al. and Van Gogh structures, one of ordinary skill would no have modified Chu et al. as a result of Van Gogh. However, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). Van Gogh. teaches windings including first and second end terminals which are connected to first and second capacitors to improve plasma distribution. It should be noted that the teachings (i.e. windings including first and second end terminals which are connected to first and second capacitors) of Van Gogh was applied to Chu et al., not for the large sized coil configuration. Thus, combining Chu et al. with Van Gogh will further improve plasma distribution.

XXII. Appellant has argued that there is nothing in Van Gogh to indicate varying the values of capacitors 308 and 310 controls the magnitude and location of a standing wave RF current in coil 104, as claim 18 requires. As stated above, since the apparatus of Chu et al.

in view of Van Gogh discloses a controller for controller varying output power of a source, varying the variable impedance arrangements, and windings including first and second end terminals which are connected to first and second capacitors, the structural limitations of apparatus claim 18 have been satisfied and therefore the function of arranging the first and second capacitors so their values control the magnitude and location of the standing wave current is considered intended use and is not given patentable weight in apparatus claims. Thus, combination of Chu et al. in view of Van Gogh satisfies the requirements of apparatus claim 18

XXIII. Appellant has argued that because of the differences in the Sato et al. in view of Tomioka et al. and Van Gogh structures, one of ordinary skill would no have modified Sato et al. in view of Tomioka et al. as a result of Van Gogh. However, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). Van Gogh. teaches windings including first and second end terminals which are connected to first and second capacitors to improve plasma distribution. It should be noted that the teachings (i.e. windings including first and second end terminals which are connected to first and second capacitors) of Van Gogh was applied to Sato et al. in view of Tomioka et al., not for the large sized coil configuration. Thus, combining Sato et al. in view of Tomioka et al. with Van Gogh will further improve plasma distribution.

In summary, each of the rejected claims is either anticipated or obvious for the reasons argued at length above. It is respectfully stressed that the structural limitations of the apparatus claims have been satisfied, and therefore the various apparatus functions (i.e. providing different electromagnetic field distributions) are considered intended use and is not given patentable weight in apparatus claims.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Michelle Crowell	Assistant Examiner	A. Michelle Crowell
Parviz Hassanzadeh	Acting Supervisory Examiner	P. Hassanzadeh
Glen Caldarola	Appeal Conferee	

November 1, 2004

Allan M. Lowe
LOWE HAUPTMAN GILMAN & BERNER, LLP
1700 Diagonal Road, Suite 310
Alexandria, VA 22314